# Review of Geotechnical Work to Date

**Advisory Committee Meeting**
**Palm Springs**
**November 30, 2004**

**J. Vrymoed/G. Buchholz**

# Conceptual Designs - Chronology

**Prior work activities funded by USBR/SSA:**

- **Work Shops**

  **Dec 17, 2002**

  **June 24, 2003**

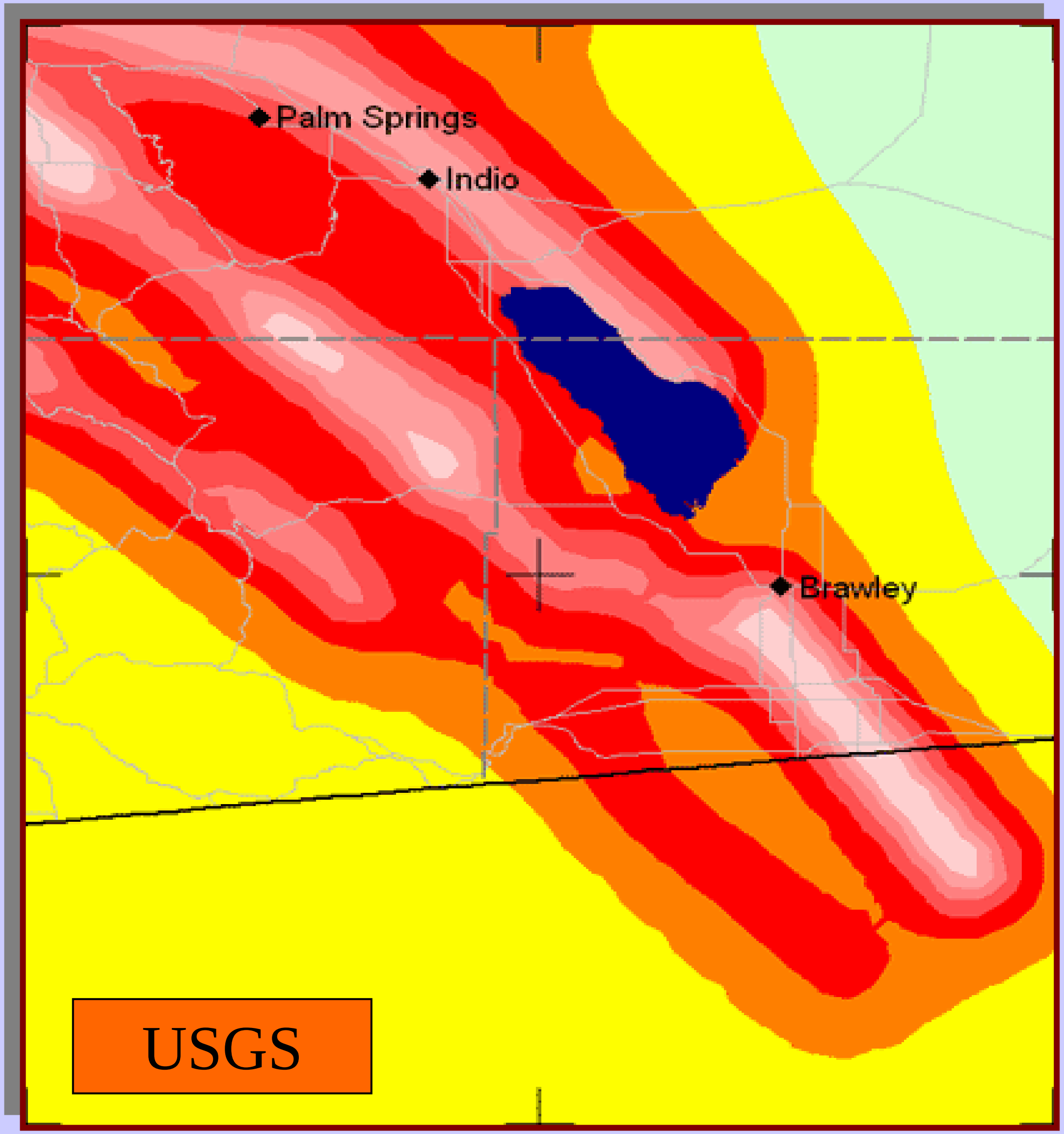
- **Subsurface Investigation – Initiated September 2003**
- **Review of preliminary subsurface data – December 16, 2003**
- **Evaluation of Concepts - March 23, 2004 workshop**

**DWR develops conceptual rock fill design – Spring 2004**

# Prior Work

# Prior Work

# Seismicity




## Peak Ground Acceleration (%G)

| | |
|---|---|
| < 10% | |
| 10 - 20% | |
| 20 - 30% | |
| 30 - 40% | |
| 40 - 50% | |
| 50 - 60% | |
| 60 - 70% | |
| 70 - 80% | |
| > 80% | |

Damage due to 0.1-0.15g

1989 Loma Prieta Earthquake – Cypress Overhead Structure

## In-Sea Rock Barrier Conceptual Design by DWR

- Utilized subsurface strength data
- Evaluated regional seismicity
- Developed seismic input motions using Dam Safety Guidelines
- Performed seismic stability analyses
- Determined hydraulic performance characteristics
- Estimated preliminary cost of rock fill
- Initiated rock quarry investigation

# Design Concepts for In-Sea Rock Barrier

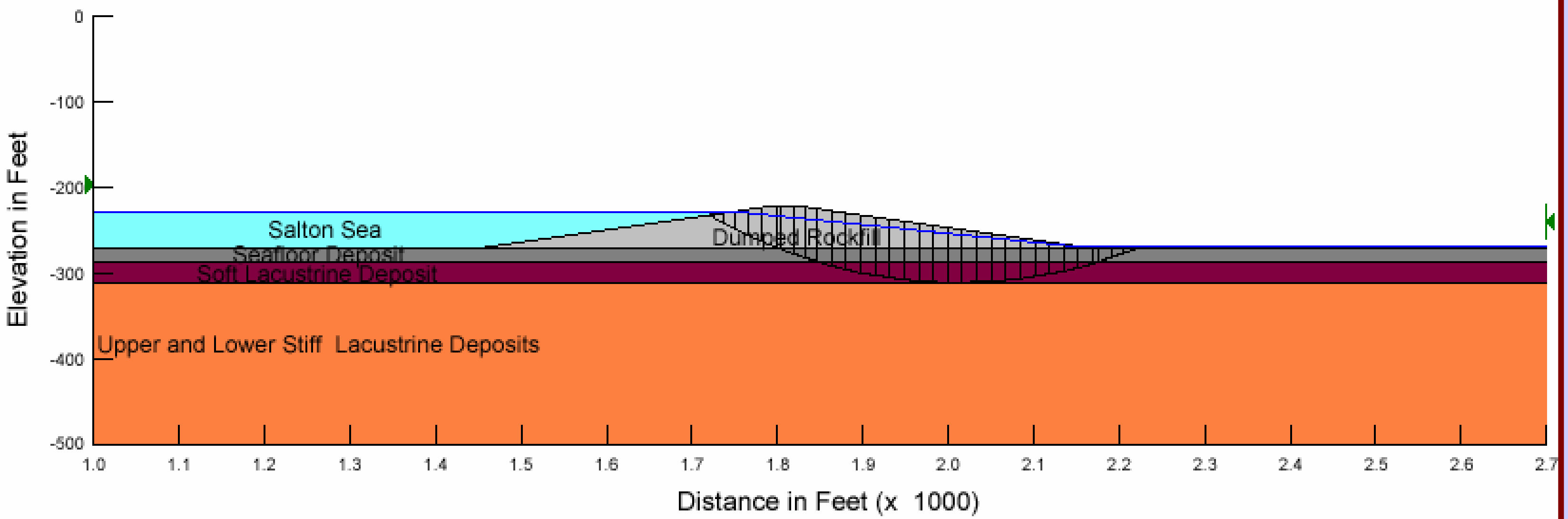
SALTON SEA RESTORATION PROJECT
DUMPED ROCKFILL EMBANKMENT ALTERNATIVE

50' High Embankment with 7H:1V Upstream and Downstream Slopes

Dumped Rockfill: Phi=42 degrees, C=0 psf (Total Strength)
Seafloor Deposit: Phi=14.5 degrees, C=0 psf (Total Strength)
Soft Lacustrine Deposit: Phi=9 degrees, C=300 psf (Total Strength)
Stiff Lacustrine Deposits: Su/sigma3'=0.5

Horizontal Acceleration = 0.05g

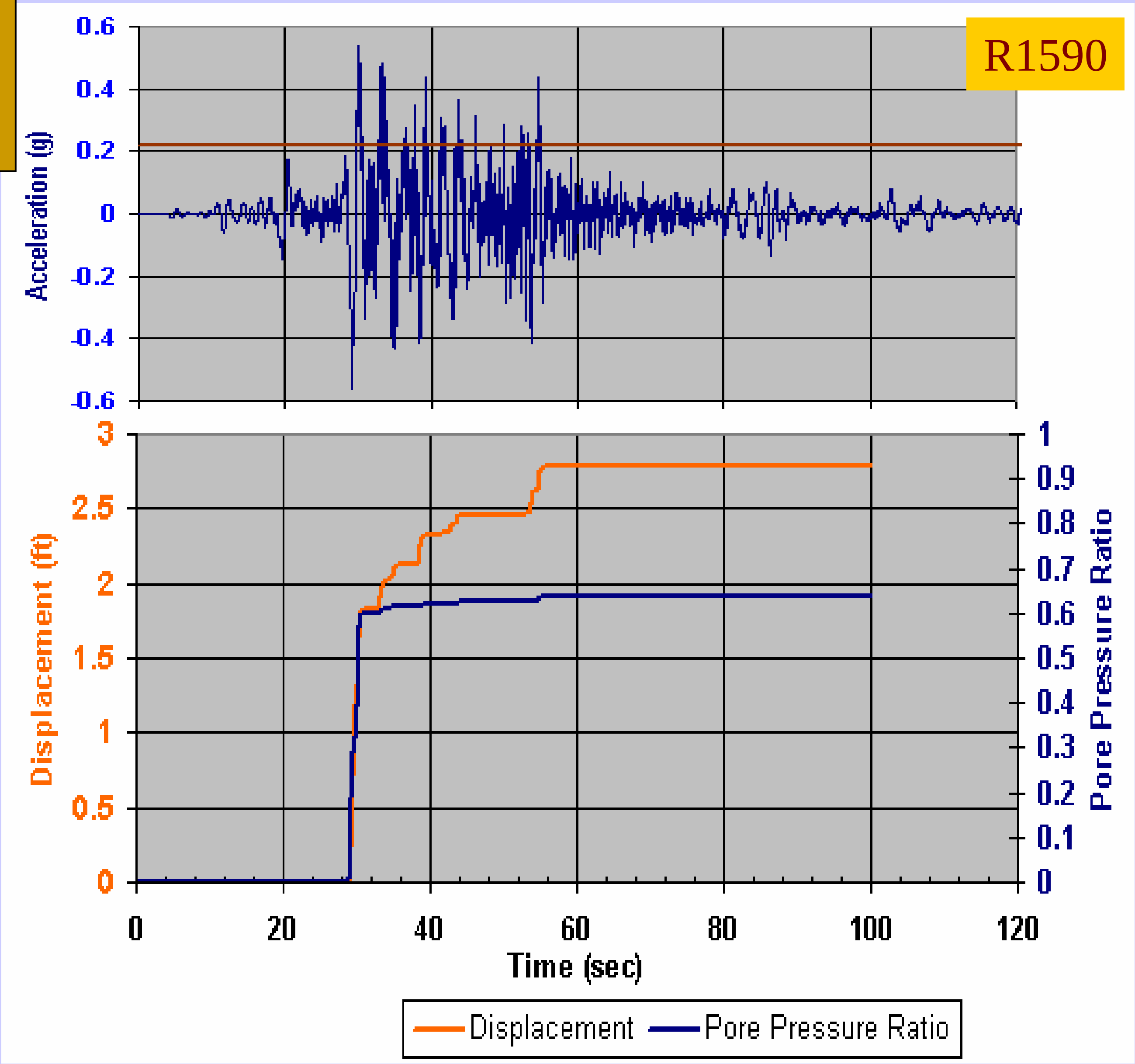
Factor of Safety = 1.0 (Spencer's Method)



# Design Concepts for In-Sea Rock Barrier

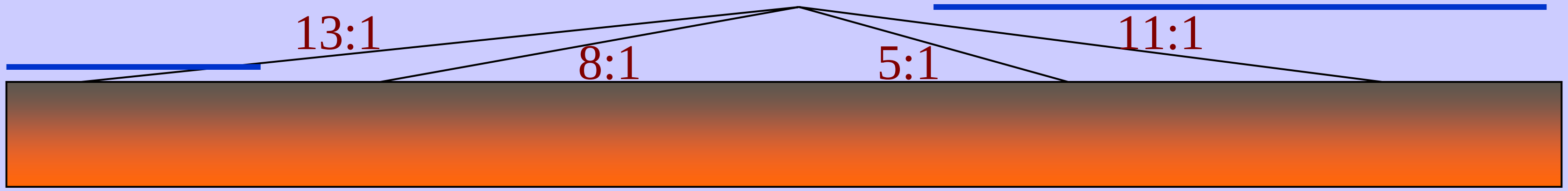
## Limiting Deformation Dynamic Analysis Method

Time Histories
- Acceleration
- Yield Acceleration
- Displacement
- Pore Pressure



# Design Concepts for In-Sea Rock Barriers

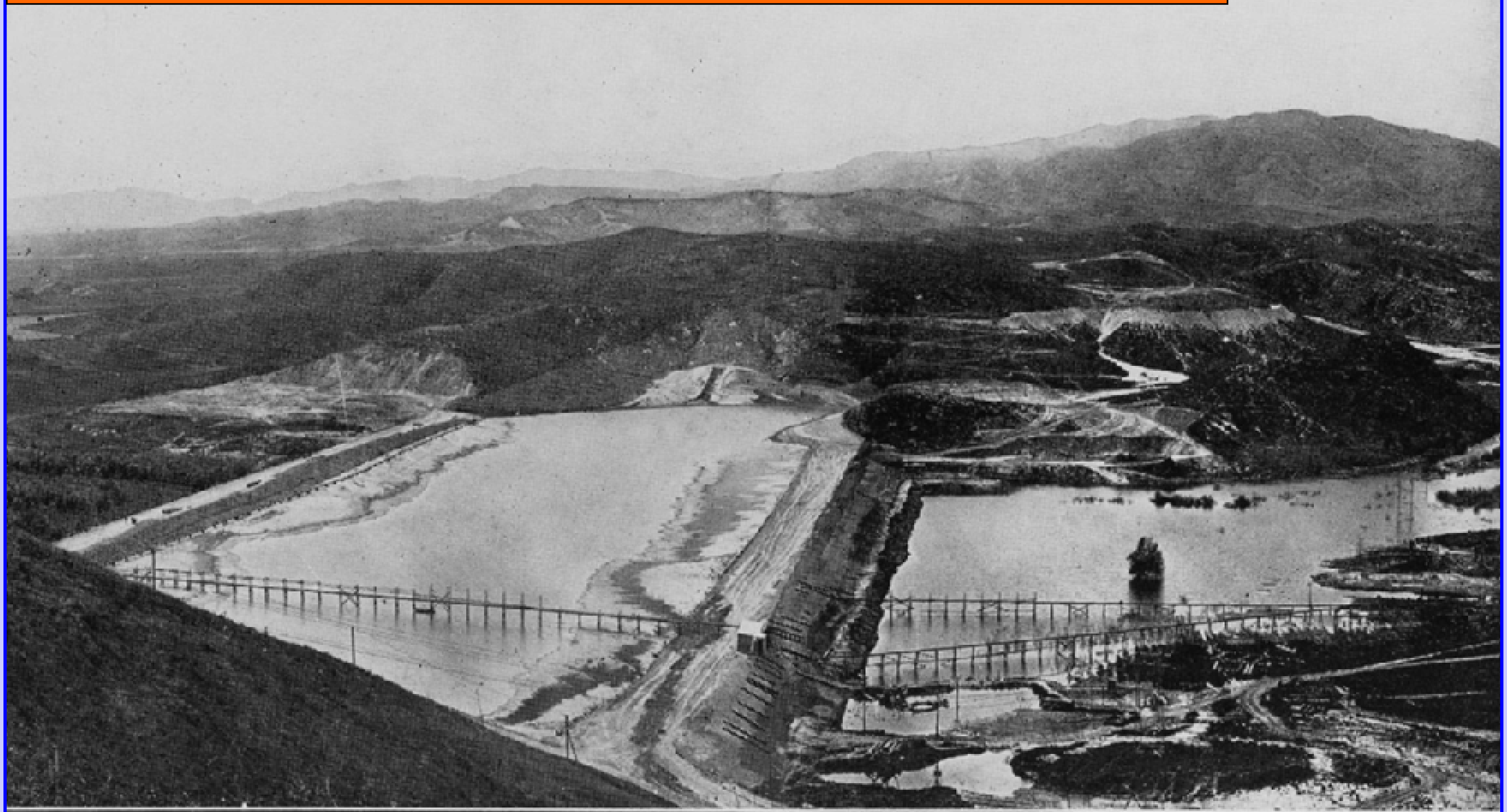
## Slope Design




Locations parallel to West Shore: Slopes 8 and 5:1,

Locations parallel to East Shore: Slopes 13 and 11:1

# Why not dredge the sea floor deposits to build barriers?



Construction of Lower San Fernando Dam, July, 1913

……Because it results in an unstable structure

Lower San Fernando Dam – 1971 Earthquake

…leading to massive failures

Lower San Fernando Dam – Reservoir Drained

# Barrier Performance Objectives

- Cost effective and feasible to construct “in-the-wet”
- Prevent uncontrolled release of impounded waters due applicable earthquake motions and fault rupture
- Tolerable and acceptable earthquake induced deformations
- Minimal to no maintenance over its design life
- Acceptable and adjustable hydraulic characteristics

## Precedence

## Great Salt Lake Causeway

Rock/Gravel created
a “semi-impervious”
barrier and 2 separate ecosystems

# Review of Geotechnical Work to Date

Phase I: Workshops, Drilling, Sampling, Testing

Phase II: Conceptual Design

Phase III:

- Quarry Investigation
- Site Specific Costs
- Refine Design Concepts